

Session 2A

Water and Gas Transport  
Through Cementitious Materials

- State of the art
  - Coupling between chemistry and transport (reactive transport)
    - Chemo transport models for concrete degradation
    - Multi-component reactive transport models
    - Use of geochemical speciation models with mass transport models for constituent release
  - Concrete degradation by water - chemical degradation of cement phases
  - Coupling with moisture transport
    - Effect of periodic precipitation events - Intermittent wetting and drying in reactive and inert atmospheres
    - Importance of gas phase transport and reactions
  - Novel methods for liquid permeability measurement of saturated concrete

- Research needs – Ability to model
  - Coupling between chemistry, transport, and mechanical/physical properties
    - Corrosion + mechanical properties
    - Cracking related to physical expansion
  - Account for microstructure and transport properties
    - Feedback effect of chemistry on porosity and diffusivities
    - Evolution of matrix properties with time
  - Unsaturated conditions
    - Diffusivity changes as a function of moisture regime
    - Gas phase transport and reactions
  - Influence of temperature on key parameters
  - Field validation of moisture conditions
  - Experimental studies coupled with model validation
  - Uncertainty analysis to account for variability

- Research needs – Accelerated test methods
  - Concrete durability – Parametric experiments
  - Standardization